

**Project Name:** Development of Nematode/Rootstock Profiles

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**Primary Investigator:** Michael McKenry

**Abstract:**

The list of potential new rootstocks has narrowed as we have developed our nematode rootstock profile using small plots and collected soil samples from replicated field trials around the state. There is no universal rootstock; one that provides resistance to root lesion, root knot, and ring nematode but still grows with vigor similar to Nemaguard. Thirty-two of the 42 rootstocks examined are resistant to root knot nematode. Thus, resistance to root-knot nematodes is available and it is not just from Nemaguard parentage. The two rootstocks with resistance to root-lesion nematode were Krymsk 1 and Krymsk 2 but the latter is too good a host for root-knot nematode. Krymsk 1 is a poorer host for root-knot supporting 25 nematodes per gram of root after 3 years of evaluation. Krymsk 1 is also dwarfing and suited to stone fruit production rather than almond production. Across the 42 rootstocks there were significant separations as to their host status to root-lesion nematode. Nemaguard was within the middle group, and supported significantly higher nematode counts than several of the peach x almond hybrids. There was also a grouping that supported significantly more root-lesion than Nemaguard but many of these were also good hosts for root-knot nematode. Resistance to ring nematode was unapparent in the first 18 rootstocks we tested. Greatest level of resistance was in Lovell as it supported half the ring population of Nemaguard. Peach x almond hybrids tend to support ring nematode counts higher than Nemaguard but this is not always the case. Testing of another 18 rootstocks will be completed in winter 2007. A two-acre field trial was established in 2006 to determine if some of our favorite almond rootstocks grow as well in fumigated ground as they grow in non-fumigated with no nematodes present. This final study gets to the question of our five-step program as a replacement for methyl bromide where nematodes are absent or resistance is present in the rootstock. Rootstocks in this new trial include Viking, Emphyrean #1, Bright's Hybrid-5, Hansen 536, and Nemaguard. Our studies were anticipated to require 3 years to complete but we will be asking for one additional year of funding to finish this body of work.

**Objective 1:** Establish a 150-day screen in field settings using 40 *Prunus* rootstocks against root lesion, *Pratylenchus vulnus*, and root knot, *Meloidogyne incognita* race 3.

In last year's report we indicated the nematode host status of 38 *Prunus* rootstocks to *P. vulnus* and *M. incognita* after 1.5 years of evaluation. By the time of the 2005 CAB meeting we presented data for 42 rootstocks but only one full year of data for: Flordaguard x weeping peach, Redglow, Flordaguard x Alnem and Mirabec rootstocks. Our final year of evaluations on these latter four stocks will be presented at the 2006 CAB meeting within a complete data package. But, we already know the general result without collecting our fourth set of samples. There was only a single rootstock that provided resistance to *P. vulnus* that was comparable to the resistant Pistachio. That was

Krymsk 1 and we have now sampled it in the third year to confirm its resistance is being maintained. This is a clone and it is dwarfing which makes it suitable for the stone-fruit industry but not the almond industry. On the positive side for the almond industry it appears there is across these 40 rootstocks a gradation of resistance mechanisms that provides a higher or lower level of protection from *P. vulnus*. Nemaguard is in the middle of the host list with numerous of the peach x almond hybrids being significantly poorer hosts than Nemaguard. For example, Cadaman, Garnem, Emphyrean #1, Monegro, Nickels, Hansen 536, Bright's Hybrid and other stocks are in this list.

When it comes to root knot nematode there is resistance in 32 of the 42 rootstocks we have screened. However most of that resistance actually emanates from crosses with Nemaguard, such as the peach x almond hybrids. Around the world the *Prunus* breeding programs have apparently focused on resistance to root knot nematodes.

It is now clear that two full years of evaluation is required for the most accurate answer on nematode host status when the nematode is *Pratylenchus vulnus*. By December 2006 we will have completed this Objective.

**Objective 2:** Establish a three to five-month greenhouse screen to determine the sensitivity of approximately 40 *Prunus* rootstocks to the rejection component that remains after Nemaguard rootstock.

We did not begin this greenhouse study in 2004 due to logistical problems. However, in spring 2006 we selected six rootstocks from among the favored rootstocks emanating from Objective 1. We had already demonstrated that Hansen 536 provided relief from the rejection component when replanting Nemaguard. In that same 2-acre field we replanted after Nemaguard using Bright's Hybrid-5, Emphyrean #1, Viking, Nemaguard, and Hansen 536. Every other row was fumigated in 2005 with Telone versus untreated and four of each of these rootstocks was planted down each row. Our goal here is to determine if switching to rootstocks that are partially Nemaguard can provide partial relief from the rejection component. There are 8 replicates consisting of four trees each with the untreated growing in the row adjacent to the fumigated. We will be quantifying the growth responses over time. This Objective will finish in fall 2007.

**Objective 3:** Evaluations of approximately 40 rootstocks against the rejection component in sand with or without ring nematode. This evaluation is expected to require two to three years.

In winter 2005 we finalized the nematode host status of 18 *Prunus* rootstocks grown for two full years in the presence of ring nematode. There were no stocks that out-performed Lovell, which supported half as many nematodes as Nemaguard. However, Guardian, and Pumiselect were poorer hosts than Nemaguard. Viking also performed very much like Lovell until the last soil sampling. Meanwhile in field settings established by farm advisors (Obj. 4) Viking has always been a much poorer host of this nematode than Nemaguard. This discrepancy of results with Viking has prompted us to repeat our 2-year experiment. Perhaps there is a cycling of ring nematode populations over time by

this rootstock that we do not understand. In 2006 we expanded with ring nematode screens involving 18 rootstocks including: Monegro, Flordaguard, Marianna 2624, Krymsk 1, Bright's Hybrid-5, Hansen 536, Viking, Torinel, Krymsk 8, Empyrean #1, Del Rey Plum, Cornerstone, Hiawatha, UCB-1 Pistachio, cloned Lovell, D63-182, E54-047, and E54-043. This study will not be finished until winter of 2007.

**Objective 4:** Quantify nematode population levels present in various field settings where some of these rootstocks are already receiving horticultural evaluation.

We have conducted nematode samplings in five existing almond rootstock trials. One site in Butte Co., 2 sites in Stanislaus/San Joaquin Co., and 2 sites in Kern Co. One additional large field trial in Stanislaus Co. has already received preliminary sampling and will receive a full sampling within a month. The two Stanislaus sites and one of the Kern Co sites have been valuable because of nematode presence across the orchard. We believe that at the end of 2006 we will have visited all the appropriate replicated rootstock trials.